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Short interbirth interval and associated factors among women with antecedent cesarean deliveries at a tertiary hospital, Southwestern Uganda

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Abstract

Background: Women with previous cesarean deliveries, have a heightened risk of poor maternal and perinatal outcomes, associated with short interbirth intervals. We determined the prevalence of short interbirth interval, and associated factors, among women with antecedent cesarean deliveries who delivered at Mbarara Regional Referral Hospital (MRRH), in southwestern Uganda.

Methods: We conducted a cross-sectional study on the postnatal ward of MRRH from November 2020 to February 2021. We enrolled women who had antecedent cesarean deliveries through consecutive sampling. We obtained participants' socio-demographic and obstetric characteristics through interviewer-administered structured questionnaires. We defined short interbirth interval as an interval between two successive births of < 33 months. Modified Poisson regression was used to identify factors associated with short interbirth intervals.

Results: Of 440 participants enrolled, most had used postpartum family planning (PPFP) prior to the current pregnancy (67.5%), and most of the pregnancies (57.2%) were planned. The mean age of the participants was 27.6 ± 5.0 years. Of the 440 women, 147 had a short interbirth interval, for a prevalence of 33% (95%CI: 29–38%). In multivariable analysis, non-use of PPFP (adjusted prevalence ratio [aPR] = 2.24; 95%CI: 1.57–3.20, $P < 0.001$), delivery of a still birth at an antecedent delivery (aPR = 3.95; 95%CI: 1.43–10.9, $P = 0.008$), unplanned pregnancy (aPR = 3.59; 95%CI: 2.35–5.49, $P < 0.001$), and young maternal age (aPR = 0.25 for < 20 years vs 20–34 years; 95%CI: 0.10–0.64, $P = 0.004$), were the factors significantly associated with short interbirth interval.

Conclusion: One out of every three womenwith antecedent caesarean delivery had a short interbirth interval. Short interbirth intervals were more common among women with history of still births, those who did not use postpartum family planning methods, and those whose pregnancies were unplanned, compared to their counterparts. Young mothers (< 20 years) were less likely to have short interbirth intervals compared to those who were 20 years or older. Efforts should be made to strengthen and scale up child-spacing programs targeting women with previous cesarean deliveries, given the high frequency of short interbirth intervals in this study population.

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Keywords: Birth spacing, Cesarean delivery, Birth Interval, Short birth interval, Uganda

Introduction

The World Health Organization (WHO) recommends an inter-pregnancy interval (birth-to-pregnancy interval) of not less than 24 months or a minimum interbirth interval of 33 months [1], in order to minimize perinatal mortality and improve maternal health. This recommendation is in line with the WHO's recommendation of a two-year minimum breastfeeding period [1]. Birth spacing patterns and practices vary worldwide, with women in low-income countries reported to have shorter interbirth intervals than their counterparts in high-income countries [2]. Globally, approximately 25% of births still occur at intervals less than the WHO recommendation; in sub-Saharan Africa, the prevalence of short birth interval is reported to be highest in Chad (30.18%) and the Democratic Republic of Congo (27.12%) [3, 4]. In Uganda, 24% of children are born less than two years after their siblings, with an estimated median birth interval of 32 months [5]. In southwestern Uganda, birth intervals haven't previously been assessed.

Several factors, including maternal age, failure or lack of contraceptive use, family size, level of male partner involvement, and sex of the previous child have been reported to influence birth spacing [2, 6]. Nevertheless, short interbirth intervals are associated with an increased risk of cesarean section delivery, preterm births, small-for-gestational age babies, postpartum haemorrhage, ruptured uterus, and death [7]. In women with previous cesarean delivery the risk for these adverse outcomes may be amplified two to three fold [8].

Uganda has a high fertility rate of 5.4 children per woman [5]. Furthermore, Children born less than 24 months after a previous birth were reported to have a much higher rate of under-5 mortality (104 deaths per 1,000 live births) than children born three years or more after a previous birth (54 deaths per 1,000 live births) [5].

Few studies that have assessed interbirth intervals in Uganda have been conducted in the general population of women of child bearing age and yet women with previous cesarean deliveries have a two to three heightened risk in poor maternal and perinatal outcomes [6, 9]. Cesarean delivery rates vary widely across health facilities in Uganda, with regional referral hospitals more likely to have caesarean delivery rates > 30% compared to lower health facilities [10]. Cesarean delivery rates have increased both at health facility and population levels in Uganda. Overall, the cesarean section rate for live births at health facilities increased from 8.5% in 2012 to 11% in 2016; the overall population-based cesarean section rate was 4.7%, and increased from 3.2 to 5.9% over the same period [11]. Given the higher risk of unfavorable maternal and perinatal outcomes among women who have had cesarean section deliveries, it is critical to identify those who are likely to have short interbirth intervals after cesarean deliveries, in order to plan interventions tailored for them. Mbarara Regional Referral Hospital (MRRH), in particular, has been reported to have high cesarean delivery rates of > 25% [12]. This study determined the prevalence and associated factors of short interbirth interval among women with antecedent cesarean deliveries who delivered at MRRH in southwestern Uganda, to inform designing of evidence-based interventions aimed at improving birth spacing in the region.

Methods

Study setting, study design and study population

This was a cross-sectional study, conducted at the post-natal ward of Mbarara Regional Referral Hospital (MRRH) from November 11, 2020 to February 12, 2021. MRRH is located in southwestern Uganda, Mbarara City. The hospital serves as a regional referral hospital for southwestern Uganda, and also teaching hospital for Mbarara University Science and Technology (MUST). It has a total bed capacity of 350 beds, 40 of which are on postnatal ward. Every year, the department performs roughly 11,000 deliveries, of which 5,000 are cesarean deliveries, representing a caesarean delivery rate of 45%. Repeat cesarean sections account for about 2,000 of these cesarean section deliveries.

Our study population was postpartum mothers who delivered at MRRH, and whose previous delivery was by cesarean section. We excluded mothers who were unable to consent or give information about previous pregnancy, including those with altered level of consciousness.

Sample size and sampling

We used Epi Info version 7.2 (CDC, Atlanta, USA) to estimate the sample size with the following assumptions: an arbitrary expected frequency of short interbirth interval of 52% [6], margin of error of 5%, at 95% level of confidence, from an estimated source population of 5,000 women with caesarean section deliveries. After factoring in a non-response rate of 20%, we estimated a sample size of 428 women. We enrolled the mothers on the postnatal ward who met the inclusion criteria into the study through consecutive sampling. Written informed consent was obtained from each study participant before recruitment and participation in the study.

Data collection and study variables

Data were collected by two research assistants using an interviewer-administered structured questionnaires. The research assistants were midwives, who were trained on the data collection tool and study procedures.

Our outcome variable was interbirth interval which was dichotomized as short and non-short interbirth interval. We defined short interbirth interval as an interval between two successive births of less than 33 months regardless of the outcome of the antecedent birth [1].

The questionnaire captured data on independent variables including socio-demographic and obstetric factors. The socio-demographic characteristics included age, marital status, residency, occupation, religion, education level, and partner support. We categorised age to take into consideration the extremes of age as follows: < 20 years for teenagers, and advanced maternal age for those > 34 years. We considered partners to be supportive if they fulfilled any two of the following tasks: providing finances, making family planning decisions together and escorting the mother to the health facility. Obstetric factors included parity, previous pregnancy outcome (whether still birth or live birth), desire for fertility, preferred sex of the baby, sex of the baby at the antecedent pregnancy, breastfeeding, postnatal care attendance for the previous pregnancy, and resumption of menses. Data on use of postpartum family planning (PPFP), methods used and time of initiation of a postpartum family planning method were also obtained. We defined PPFP as the initiation and use of family planning services within the first 12 months following childbirth [13]. We categorized return of menses as < 6 months and ≥ 6 months after; this is because return of menses between birth and 6 months would indicate early return of menses especially for the women who are not exclusively breastfeeding [14]. We categorized resumption of coitus as < 1 month and ≥ 1 month postpartum; this is because initiation of coitus < 1 months postpartum is considered early resumption [15].

Data management and analysis

Data were entered into Redcap and exported to STATA version 15 (*StataCorp*, College Station, Texas, USA) for analysis.

We described the demographic and obstetric characteristics of the study participants, and expressed the descriptive statistics as frequencies/percentages. We then compared the categorical variables between women with short interbirth interval and those with non-short interbirth interval, using Pearson's chi square test. The prevalence of short interbirth interval was calculated as a proportion of women who met the definition of short interbirth interval— by dividing the number of women with short interbirth interval by the total number of postpartum women with antecedent cesarean deliveries, and expressed as a percentage.

To identify factors associated with short interbirth interval, we used modified Poisson regression model that included robust standard errors, based on a generalized linear model with the Poisson family and a log link without an offset. Corresponding prevalence ratios (PRs) with their 95% confidence intervals (CIs) were reported as our measures of association. In this cross-sectional study, the modified Poisson regression was chosen over logistic regression to avoid odds ratios overestimating the effect size, in our scenario where the prevalence of the outcome was high [16]. All variables associated with short interbirth interval at univariable analysis (with P value < 0.2) were included into the final multivariable model to determine the adjusted correlates of short interbirth interval. We assessed for collinearity using variance inflation factor (VIF); we eliminated highly correlated variable (with VIF > 5) in the final multivariable model. Variables with P values < 0.05 in the final model were considered statistically significant.

Results

Out of 2,253 mothers admitted for delivery from November 2020 to February 2021 at MRRH, we present results for 440 participants who were enrolled into the study. Eight women, including four who left hospital before consenting, and two who declined to consent, were excluded from the study (Fig. 1).

Socio-demographic characteristics of study participants

The mean age of the study participants was 27.6 ± 5.0 years. Of the 440 participants, most were of rural residence (58.4%), had attained primary education (42.5%), and were unemployed (62.9%); the majority (95.4%) were married. The proportions of unemployed women (78.1% Vs 58.4%; $P = 0.005$), and those residing in rural areas (66.7% Vs 54.3%; $P = 0.013$) were significantly higher in the short interbirth interval group than in the non-short interbirth interval group (Table 1). Participants with short interbirth interval were of significantly younger age compared those without short interbirth interval ($P = 0.010$). Other socio-demographic characteristics were similar between the two groups.

Obstetric characteristics of study participants

Of the 440 participants, most were para 1–4 (88.2%), had used PPFP prior to the current pregnancy (67.5%) and had their pregnancies planned (57.2%) (Table 2). The majority (96.4%) of the participants had live births in the antecedent deliveries. The proportions of antecedent

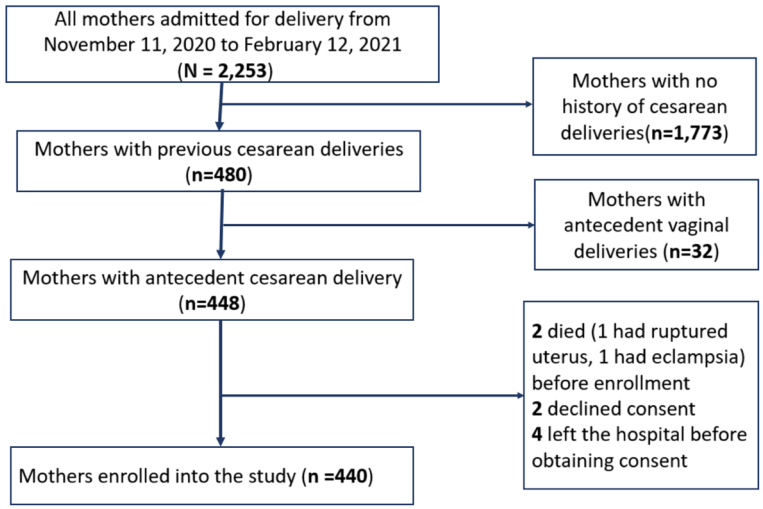

Fig. 1 Flow chart for recruitment of study participants at Mbarara Regional Referral Hospital, southwestern Uganda, November 2020–February 2021

birth outcomes, use and time of initiation of PPFP, return of menses after delivery, and whether the pregnancy was planned differed significantly between mothers with short interbirth interval and those without short interbirth interval.

Prevalence of short interbirth interval

Of the 440 participants who were enrolled into the study, 147 had short interbirth interval, for a prevalence of 33.4% (95% CI: 29.1–38.0). Among the 147 women with short interbirth interval, 34 (23%) had an interbirth interval of < 18 months, 43 (29.3%) had interbirth interval between 18–23 months, and the remaining 70 (47%) had interbirth interval of 24–32 months.

Factors associated with short interbirth interval

At multivariable analysis, age less than 20 years (aPR = 0.25; 95%CI: 0.10–0.64, $P = 0.004$), history of having had a still birth at an antecedent pregnancy (aPR = 3.95; 95%CI: 1.43–10.9, $P = 0.008$), non-use of a postpartum family planning method (aPR = 2.24; 95%CI: 1.57–3.20, $P < 0.001$), and having an unplanned pregnancy (aPR = 3.59; 95%CI: 2.35–5.49, $P < 0.001$) were independently associated with a short interbirth interval (Table 3).

Discussion

Adequate interbirth intervals allow mothers to recover from the effects of pregnancy and to be in optimum health before the next pregnancy, by enabling replenishment of macro-and micronutrient stores that get depleted during pregnancy and lactation. This study determined the prevalence of short interbirth interval and associated factors among women who had previously delivered by cesarean section at a tertiary hospital in southwestern Uganda. One out of every three women with an antecedent cesarean delivery had a short interbirth interval in the current study. The prevalence of short interbirth interval was significantly higher among women with history of still births at previous pregnancies, those who did not use postpartum family planning methods, and those whose pregnancies were unplanned, compared to their counterparts. However, the prevalence of short interbirth interval was significantly lower among young mothers (< 20 years).

There is paucity of literature on prevalence of short interbirth intervals among women who have had previous cesarean section deliveries, making it difficult to compare our findings. Nonetheless, the prevalence in this study is higher than the reported worldwide prevalence of short interbirth intervals (25%) in the general population, and the regional prevalence in the sub-Saharan Africa (20%) [3].

In the current study, women who had still births at antecedent pregnancies were more likely to have short interbirth intervals compared to those who had live births. This is in agreement with previous findings from Bangladesh [17], Ethiopia [18, 19], and Uganda [20]. This finding may be attributed to the fact that couples with a previous still birth may intentionally deliver another baby to replace the lost child as early as possible. Mothers with infant and perinatal deaths also lack the protective mechanism of lactation, hence menses and fertility return early resulting in short interbirth intervals [14]. On the basis of this finding, women with still births and perinatal deaths should be targeted for

Table 1 Socio-demographic characteristics of women with antecedent caesarean delivery at Mbarara Regional Referral Hospital

Variable	Total ($N=440$) n (%)	Short inter-delivery interval, n (%)	
		Yes ($n=147$)	No ($n=293$)
Age in years			
< 20	46 (10.5)	7 (4.8)	39 (13.3)
20–34	385 (87.5)	135 (91.8)	250 (85.3)
> 34	9 (2.1)	5 (3.4)	4 (1.4)
Residence			
Urban	183 (41.6)	49 (33.3)	134 (45.7)
Rural	257 (58.4)	98 (66.7)	159 (54.3)
Level of Education			
Tertiary	75 (17.0)	20 (13.6)	55 (18.8)
Secondary	156 (35.5)	55 (37.4)	101 (34.5)
Primary	187 (42.5)	60 (40.8)	127 (43.3)
Uneducated	22 (5.0)	12 (8.2)	10 (3.4)
Employment status			
Employed	163 (37.1)	41 (27.9)	122 (41.6)
Unemployed	277 (62.9)	106 (72.1)	171 (58.4)
Religion			
Anglican	188 (42.7)	60 (40.8)	128 (43.7)
Catholic	137 (31.1)	47 (32.0)	90 (30.7)
Pentecostal	69 (15.7)	26 (17.7)	43 (14.7)
Moslem	46 (10.5)	14 (9.5)	32 (10.9)
Marital status			
Married	420 (95.4)	144 (98.0)	276 (94.2)
Unmarried	20 (4.6)	03 (2.0)	17 (5.8)
Partner support			
Yes	413 (93.9)	139 (94.6)	274 (93.5)
No	27 (6.1)	8 (5.4)	19 (6.5)
Preferred sex of the baby			
Yes	376 (85.5)	130 (88.4)	246 (84.0)
No	64 (14.5)	17 (11.6)	47 (16.0)

Table 2 Obstetric characteristics of women with antecedent caesarean delivery at Mbarara Regional Referral Hospital

Variable	Total ($N=440$), n (%)	Short interbirth interval, n (%)	
		Yes ($n=147$)	No ($n=293$)
Parity			
1–4	388 (88.2)	126 (85.7)	262 (894)
≥ 5	52 (11.8)	21 (14.3)	31 (10.6)
Antecedent birth outcome			
Live birth	424 (96.4)	135 (91.8)	289 (98.6)
Still birth	16 (3.6)	12 (8.2)	4 (1.4)
Desired more children			
Yes	395 (89.8)	131 (89.1)	264 (90.1)
No	45 (10.2)	16 (10.9)	29 (9.9)
Postnatal care attendance[a]			
Yes	116 (26.4)	36 (24.5)	80 (27.3)
No	324 (73.6)	111(75.5)	213 (72.7)
PPFP use			
Yes	297 (67.5)	65 (44.2)	232 (79.2)
No	143 (32.5)	82 (55.8)	61 (20.8)
Time at initiation of PPFP			
< 6 weeks	80 (26.9)	22 (33.8)	58 (25)
6 weeks–1 year	159 (53.5)	38 (58.5)	121 (52.2)
> 1 year	58 (19.5)	5 (7.7)	53 (22.8)
PPFP method used			
Pills	15 (5.1)	4 (6.2)	11 (4.7)
Injectables	175 (58.9)	44 (67.7)	131 (56.5)
Implants	87 (29.3)	14 (21.5)	73 (31.5)
IUDs	14 (4.7)	1 (1.5)	13 (5.6)
Others	6 (2.0)	2 (3.1)	4 (1.7)
Exclusive breastfeeding			
≥ 6 months	295 (70.2)	87 (65.4)	208 (72.5)
< 6 months	125 (29.8)	46 (34.6)	79 (27.5)
Resumption of coitus			
≥ 1 month	420 (95.5)	138 (94.5)	282 (96.3)
< 1 month	20 (4.5)	8 (5.5)	11 (3.8)
Return of menses			
≥ 6 months	186 (42.3)	53 (36.1)	133(45.4)
< 6 months	254 (57.7)	94 (63.9)	160 (54.6)
Planned current pregnancy			
Planned	252 (57.3)	44 (29.9)	208 (71.0)
Unplanned	188 (42.7)	103 (70.1)	85 (29.0)

PPFP Postpartum Family Planning, *IUD* Intrauterine device, [a]Postnatal care attendance considered was for the previous pregnancy

family planning counseling to ensure optimum birth spacing.

In this study, non-use of postpartum family planning, and having unplanned pregnancy were associated with short interbirth intervals. This finding is consistent with findings from previous studies [6, 20–22]. Women who have unplanned pregnancies are likely not to be on family planning methods, and often rely on natural family planning methods, including lactational amenorrhea. In addition, women who plan their pregnancies may follow the recommendations for child spacing, such as use of postpartum family planning and hence end up with optimal birth intervals. Therefore, there is a need to counsel women and their spouses about contraception and opportunities for safer conception, given that pregnancy intentions are associated with having planned pregnancies [23].

Our study found that young mothers (< 20 years) were less likely to have short interbirth intervals compared to their older counterparts. Similar findings were reported

Table 3 Factors associated with short interbirth among women with antecedent caesarean deliveries at Mbarara Regional Referral Hospital

Variable	%Short IDI n/N (%)	Univariable analysis		Multivariable analysis	
		cPR (95%CI)	*P*-value	aPR (95%CI)	*P*-value
Age in years					
20–34	135/385 (35.1)	Ref		Ref	
< 20	7/46 (15.2)	0.38 (0.20–0.93)	0.031	0.25 (0.10–0.64)	0.004
> 34	5/9 (55.6)	1.58 (0.65–3.87)	0.312	1.08 (0.36–3.18)	0.892
Residence					
Urban	49/183 (26.8)	Ref		Ref	
Rural	98/257 (38.1)	1.42 (1.01 -2.01)	0.043	1.28 (0.85–1.93)	0.244
Level of Education					
Tertiary	20/75 (26.7)	Ref		Ref	
Secondary	55/156 (35.3)	1.32 (0.79–2.21)	0.285	1.30 (0.73–2.32)	0.374
Primary	60/187 (32.1)	1.20 (0.73–1.99)	0.474	0.89 (0.58–1.84)	0.974
Uneducated	12/22 (54.6)	2.05 (1.00–4.18)	0.050	1.08 (0.44–2.68)	0.859
Employment status					
Employed	41/163 (25.2)	Ref		Ref	
Unemployed	106/277 (38.3)	1.52 (1.06–2.18)	0.023	1.32 (0.84–2.06)	0.223
Marital status					
Married	144/420 (34.3)	Ref	Ref		
Unmarried	3/ 20(15.0)	0.44 (0.14–1.37)	0.156	0.26 (0.06–1.05)	0.059
Antecedent birth outcome					
Live birth	135/424 (31.8)	Ref		Ref	
Still birth	12/16 (75.0)	2.36 (1.31–4.24)	0.004	3.95 (1.43–10.9)	0.008
PPFP use					
Yes	65/297 (21.9)	Ref		Ref	
No	82/143 (57.3)	2.65 (1.89–3.63)	< 0.001	2.24 (1.57–3.20)	< 0.001
Time of initiation of PPFP[a]					
< 6 weeks	22/80 (27.5)	Ref			
6 weeks-1 year	42/159 (26.4)	0.96 (0.58–1.61)	0.878		
> 1 year	5/58 (8.6)	0.31 (0.12–0.83)	0.019		
Exclusive breastfeeding					
≥ 6 months	87/295 (29.5)	Ref		Ref	
< 6 months	46/125 (36.8)	1.24 (0.87–1.78)	0.225	1.14 (0.77–1.70)	0.506
Return of menses					
> 6 months	53/184 (28.8)	Ref		Ref	
< 6 months	94/250 (37.6)	1.39(0.93–1.84)	0.120	1.27 (0.88–1.82)	0.197
Planned current pregnancy					
Planned	44/252 (17.5)	Ref		Ref	
Unplanned	103/188 (54.8)	3.14 (2.20–4.47)	< 0.001	3.59 (2.35–5.49)	< 0.001

PPFP Postpartum Family Planning, *cPR* Crude Prevalence Ratio, *aPR* Adjusted Prevalence Ratio, *CI* Confidence Interval, *Ref* Reference category, [a]Eliminated from multivariable model due to collinearity

in Bangladesh [24] and Ethiopia [18]. However, in USA, a study found that short interbirth intervals were common in teen pregnancies [25]. Similarly, our finding contradicts findings from a study done in selected sub-Saharan African countries, which reported that younger women tend to have shorter birth intervals [4]. The plausible explanation for this finding in our study, could be because teenage mothers believe they have more time and therefore are not under any pressure to deliver quickly, and may tend to wait longer [24]. Delivery by cesarean section is perceived negatively by most African women as not being "womanly" enough; this negative perception is more in teenage mothers [26]. The young mothers may therefore tend to wait longer

in order to be given chance to deliver vaginally at the next delivery. Moreover, many of these young mothers may not be married at the time of their first pregnancy; marriage is known to influence interbirth interval [27]. However, a study in Uganda found that more than half of women who had their first birth < 18 years had repeat adolescent birth [28]. This may suggest that other socio-cultural factors, including male child preference, maternal age at marriage, and decision-making powers being vested in the husband, may also influence the decision to use a postpartum family planning method, hence affecting birth intervals [29–31].

Given the heightened risk for poor maternal and perinatal outcomes associated with sub-optimal child spacing among women with previous cesarean deliveries [8], our findings point towards the need to strengthen and scale-up child-spacing programs in the region, especially targeting women with cesarean deliveries. This may necessitate use of more innovative and multifaceted approaches to facilitate uptake of modern family planning methods including postpartum intrauterine devices (PPIUDs) that have proved to have expulsion rates that are low and comparable to interval IUD insertions in the region [32]. Strengthening prenatal and postnatal family planning counselling may also improve uptake of PPFP, and improve birth spacing [33]. Additionally, open dialogue sessions on birth spacing, organized by women's groups in communities, may also improve the uptake of modern family planning methods even further. As has been demonstrated elsewhere [34], such community mobilization approaches can result in positive changes in health behaviors, by encouraging active participatory learning Mothers who have had perinatal deaths and those with still births, should especially be targeted during postnatal family planning counselling sessions. Future studies are required to assess the implications short interbirth intervals, with regard to maternal and perinatal outcomes, among women with cesarean section deliveries in our Ugandan setting.

Our study is not without limitations. First, some data on dependent and independent variables were based on self-reports. This may have resulted into social-desirability bias [35]. Nevertheless, we verified these data using hospital medical forms and antenatal booking cards. Second, the cross-sectional nature of our study design limits us from making causal inferences from our findings. The strength of our study lies in it being one of initial studies to characterize birth intervals in the unique population of women with antecedent cesarean deliveries, as most earlier studies have heavily focused on the general population of women of childbearing age.

Conclusion

This study found that one out of every three women who delivered at MRRH in southwestern Uganda, with an antecedent cesarean delivery had a short interbirth interval. Short interbirth interval was significantly more common among women with history of still births at previous pregnancies, those who did not use postpartum family planning methods, and those whose pregnancies were unplanned, compared to their counterparts. Young mothers (< 20 years) were less likely to have short interbirth intervals compared to those who were 20 years or older. Efforts should be made to strengthen and scale up child-spacing programs targeting women with previous cesarean deliveries, given the high frequency of short interbirth intervals in this study population.

Abbreviations

aPR: Adjusted Prevalence Ratio; CI: Confidence Interval; cPR: Crude Prevalence Ratio; DRC: Democratic Republic of Congo; IUD: Intrauterine Device; MRRH: Mbarara Regional Referral Hospital; PPFP: Postpartum Family Planning; PPIUD: Postpartum Intrauterine Device; PR: Prevalence Ratio; WHO: World Health Organization.

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Authors' contributions

OB, HK, PKK, JM, GSW, HML, JN, KRMG, MK, and GM contributed to the conception and design of the study. RM and OB performed formal data analysis. OB, LT, MK, PKK, JN, and AB contributed to drafting the manuscript. OB and OMA contributed to study implementation and data acquisition. AB, MK, JN and HK critically reviewed and revised the manuscript for key content. OB prepared the final manuscript. All authors read and approved the final manuscript.

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Availability of data and materials

The datasets generated and analysed for this study are available from the corresponding author, upon request.

Declarations

Ethics approval and consent to participate

This study was approved by the Faculty of Medicine Research Committee, Mbarara University of Science and Technology Research Ethics Committee (REC No. 01/10–20), and Uganda National council of Science and Technology (Ref. No. HS1354ES). Administrative clearance was obtained from the office of the Hospital Director, Mbarara Regional Referral Hospital, prior to conducting the study. Written informed consent was obtained from each study participant before recruitment and participation in the study. Confidentiality of the study participants was ensured by using unique identifiers. Participants were free to withdraw from the study at any time during the study. Participants who had lost their babies were linked to a counsellor for psychosocial support. Recruitment into the study was voluntary and free. At the end of the interview, each participant was given health education on child spacing and offered a postpartum family planning method for those who opted to take a method. We respected the guidelines of Helsinki and CIOMS-2002 (Council

for International Organizations of Medical Sciences) regarding research with humans, avoiding any type of physical or moral harm.

Consent for publication
Not applicable.

Competing interests
The authors declare that they have no competing interests with regard to publication of this work.

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References

1. World Health Organization. Report of a WHO technical consultation on birth spacing: Geneva, Switzerland 13–15 June 2005. World Health Organization; 2007. https://www.who.int/reproductivehealth/publications/family_planning/WHO_RHR_07_1/en/. Accessed 28 Mar 2022.
2. Pimentel J, Ansari U, Omer K, Gidado Y, Baba MC, Andersson N, et al. Factors associated with short birth interval in low- and middle-income countries: a systematic review. BMC Pregnancy Childbirth. 2020;20(1):156.
3. Rutstein S. Trends in birth spacing. DHS comparative reports no 28. Calverton, Maryland, USA: ICF Macro; 2011.
4. Ajayi AI, Somefun OD. Patterns and determinants of short and long birth intervals among women in selected sub-Saharan African countries. Medicine. 2020;99(19):e20118.
5. Uganda Bureau of Statistics (UBOS) and ICF. ICF: Uganda Demographic and Health Survey 2016. Kampala, Uganda and Rockville, Maryland, USA: UBOS and ICF; 2018.
6. Aleni M, Mbalinda S, Muhindo R. Birth intervals and associated factors among women attending young child clinic in Yumbe Hospital. Uganda Int J Reprod Med. 2020;2020:1326596.
7. Conde-Agudelo A, Rosas-Bermúdez A, Kafury-Goeta AC. Effects of birth spacing on maternal health: a systematic review. Am J Obstet Gynecol. 2007;196(4):297–308.
8. Stamilio DM, DeFranco E, Paré E, Odibo AO, Peipert JF, Allsworth JE, et al. Short interpregnancy interval: risk of uterine rupture and complications of vaginal birth after cesarean delivery. Obstet Gynecol. 2007;110(5):1075–82.
9. Ronald M, Musa M, Sezalio M, Innoncent N, Joseph N, Andrew C, et al. Factors Associated with Short Births Intervals among Women Delivering at Mbarara Hospital. Journal of Health, Medicine and Nursing. 2016;26:14. https://iiste.org/Journals/index.php/JHMN/article/view/30850.
10. Okolo I, Lugobe HM, Garba D, Tibaijuka L, Byamukama O, Ngonzi J, et al. 1095 Cesarean delivery variation across facilities in Uganda. Am J Obstet Gynecol. 2021;224(2):S675.
11. Atuheire EB, Opio DN, Kadobera D, Ario AR, Matovu JK, Harris J, et al. Spatial and temporal trends of cesarean deliveries in Uganda: 2012–2016. BMC Pregnancy Childbirth. 2019;19(1):1–8.
12. Natasha S. Cesarean section rates and indications at MRRH.[Pdf]. 2016.
13. World Health Organization. Programming strategies for postpartum family planning. 2013.
14. Jackson E, Glasier A. Return of ovulation and menses in postpartum nonlactating women: a systematic review. Obstet Gynecol. 2011;117(3):657–62.
15. Knutson AJ, Boyd SS, Long JB, Kjerulff KH. Early resumption of sexual intercourse after first childbirth and unintended pregnancy within six months. Womens Health Issues. 2022;32(1):51–6.
16. Barros AJ, Hirakata VN. Alternatives for logistic regression in cross-sectional studies: an empirical comparison of models that directly estimate the prevalence ratio. BMC Med Res Methodol. 2003;3(1):1–13.
17. van Soest A, Saha UR. Relationships between infant mortality, birth spacing and fertility in Matlab, Bangladesh. PLoS One. 2018;13(4):e0195940.
18 Shifti DM, Chojenta C, G. Holliday E, Loxton D. Individual and community level determinants of short birth interval in Ethiopia: a multilevel analysis. PLoS One. 2020;15(1):e0227798.
19. Tsegaye D, Shuremu M, Bidira K. Practice of child spacing and its associated factors among women of child bearing age (15 to 49 years) in Illubabor zone, South West Ethiopia. Int J Nurs Midwifery. 2017;9(7):102–8.
20. Mayanja Ronald M, Mubiru Musa M, MasembeSezalio M, Nkonwa IM. Factors associated with short births intervals among women delivering at Mbarara Hospital. Age. 2016;15(19):20–30.
21 Damtie Y, Kefale B, Yalew M, Arefaynie M, Adane B. Short birth spacing and its association with maternal educational status, contraceptive use, and duration of breastfeeding in Ethiopia. A systematic review and meta-analysis. PloS One. 2021;16(2):e0246348.
22. Gebrehiwot SW, Abera G, Tesfay K, Tilahun W. Short birth interval and associated factors among women of child bearing age in northern Ethiopia, 2016. BMC Womens Health. 2019;19(1):85.
23. Atukunda EC, Mugyenyi GR, Atuhumuza EB, Kaida A, Boatin A, Agaba AG, et al. Factors associated with pregnancy intentions amongst postpartum women living with HIV in rural Southwestern Uganda. AIDS Behav. 2019;23(6):1552–60.
24. De Jonge HC, Azad K, Seward N, Kuddus A, Shaha S, Beard J, et al. Determinants and consequences of short birth interval in rural Bangladesh: a cross-sectional study. BMC Pregnancy Childbirth. 2014;14(1):1–7.
25. Gemmill A, Lindberg LD. Short interpregnancy intervals in the United States. Obstet Gynecol. 2013;122(1):64.
26. Gandau BBN, Nuertey BD, Seneadza NAH, Akaateba D, Azusong E, Yirifere JY, et al. Maternal perceptions about caesarean section deliveries and their role in reducing perinatal and neonatal mortality in the Upper West Region of Ghana; a cross-sectional study. BMC Pregnancy Childbirth. 2019;19(1):1–14.
27. MacQuarrie KLD. Marriage and fertility dynamics: The influence of marriage age on the timing of first birth and birth spacing (DHS Analytical Studies No. 56). 2016. https://dhsprogram.com/publications/publication-as56-analytical-studies.cfm.
28. Amongin D, Nakimuli A, Hanson C, Nakafeero M, Kaharuza F, Atuyambe L, et al. Time trends in and factors associated with repeat adolescent birth in Uganda: analysis of six demographic and health surveys. PLoS One. 2020;15(4):e0231557.
29. Ejigu AG, Yismaw AE, Limenih MA. The effect of sex of last child on short birth interval practice: the case of northern Ethiopian pregnant women. BMC Res Notes. 2019;12(1):1–6.
30. Hailu D, Gultie T, Workineh Y. Barriers to adherence of optimal birth spacing: a qualitative study among mothers and their husbands in Arba Minch Zuria District, Ethiopia. Am J Health Res. 2014;2(4):188–95.
31. McGuire C, Stephenson R. Community factors influencing birth spacing among married women in Uganda and Zimbabwe. Afr J Reprod Health. 2015;19(1):14–24.
32. Muhumuza J, Migisha R, Ngonzi J, Kayondo M, Mugyenyi G. Risk factors for postpartum intrauterine device expulsion among women delivering at a tertiary Hospital in Uganda: a prospective cohort study. Contracept Reprod Med. 2021;6(1):7.
33. Puri MC, Huber-Krum S, Canning D, Guo M, Shah IH. Does family planning counseling reduce unmet need for modern contraception among postpartum women: Evidence from a stepped-wedge cluster randomized trial in Nepal. PloS One. 2021;16(3):e0249106.
34. Damtew ZA, Karim AM, Chekagn CT, FessehaZemichael N, Yihun B, Willey BA, et al. Correlates of the Women's Development Army strategy implementation strength with household reproductive, maternal, newborn and child healthcare practices: a cross-sectional study in four regions of Ethiopia. BMC Pregnancy Childbirth. 2018;18(1):373.
35. Althubaiti A. Information bias in health research: definition, pitfalls, and adjustment methods. J Multidiscip Healthc. 2016;9:211.

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